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EXAMINATION OF CEREBROSPINAL FLUID IN CLINICAL DIAGNOSIS*

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Detailed examination of cerebrospinal fluid is a comparatively recent aid in clinical diagnosis, for Quincke,¹ in 1891, was the first to make detailed laboratory examination of the fluid. In 1912 it was first realized that chemical analysis of the fluid was of diagnostic importance. Cerebrospinal fluid is well suited for clinical examination because normally it is crystal clear and contains a low percentage of solids and thus reflects admirably any changes that may occur in the brain or spinal cord.

Function and Formation of Cerebrospinal Fluid

The chief function of the fluid is apparently a simple mechanical one, in that it acts as a cushioning, hydraulic jacket for the brain and cord. It probably does not play any significant role in providing nutrition to the brain. There is no circulation of the fluid except for a certain passive flow attributable to respiratory movements, pulse beats and changes in position. The rate of formation of cerebrospinal fluid is closely related to changes in the hydrostatic and osmotic pressures of the blood, but there is no accurate method for measuring this rate. If the osmotic pressure of the blood serum

*Read before the meeting of the Wisconsin Association of Medical Technologists, LaCrosse, Wisconsin, May 17, 1941.

falls, the rate of formation of cerebrospinal fluid increases, whereas the rate of formation lessens with increased osmotic pressure of the serum. At the onset of acute febrile diseases, especially among children, there is a transient fall in osmotic pressure in the serum and a corresponding increase in amount of cerebrospinal fluid. This produces the syndrome termed "meningismus," which may be confused with actual meningitis. Examination of the fluid in these cases usually suffices to distinguish between the two conditions. In meningismus the fluid may be under somewhat increased pressure but is clear and contains no organisms. The number of cells usually is within normal limits, but it may be increased to 20 or 30 cells per cubic millimeter, most of which usually are lymphocytes.

Cerebrospinal fluid is formed in the choroid plexus, which is a rich network of blood vessels in the ventricles, or cavities, of the brain. There is great controversy as to the actual mechanism of formation of the cerebrospinal fluid, but the weight of evidence indicates that it probably is formed by mechanical filtration through the choroid plexus. This theory is based on the assumption that the choroid plexus functions as a dialyzing membrane and that the cerebrospinal fluid is a simple dialysate of the blood.

The specific gravity of cerebrospinal fluid ranges from 1.006 to 1.009. Fluid removed from the ventricles of the brain is lighter, and its specific gravity ranges from 1.002 to 1.004. Fluids in which the content of protein is high have an elevated specific gravity.

Chemical Constituents

The chloride content of cerebrospinal fluid present as sodium chloride, ranges from 700 to 750 mg. per 100 cc. This is somewhat more than the chloride content of blood plasma, which averages 600 mg. per 100 cc. In general, the chloride level in the cerebrospinal fluid is a reflection of the chloride level in the blood. It may be decreased in fever and vomiting and increased in cases of renal failure. The lowest values usually are found in cases of acute purulent meningitis.

The most frequent abnormality in cerebrospinal fluid is an alteration in the content of protein, which usually is manifested as an increase. The normal level of protein varies from 15 to 45 mg. per

100 cc., and averages about 30 mg. per 100 cc. This is much less than the value for protein in the blood which composes approximately 7 per cent of the blood, or 7,000 mg. per 100 cc. The protein of the cerebrospinal fluid consists almost entirely of albumin and globulin in a ratio of 5:1. In pathologic conditions, euglobulin and fibrinogen may appear. Fibrinogen commonly appears in inflammatory reactions involving the meninges, and is revealed by formation of a fibrin clot. Slight increases in protein are rather common, but values more than 500 mg. per 100 cc. are comparatively infrequent and usually are seen only in cases of meningitis, tumors of the spinal cord, bloody cerebrospinal fluid or brain tumor. In meningitis, the increased protein is due to transudation of serum through the inflamed vessels. In hemorrhage, the increased protein is attributable to the serum protein of the extravasated blood.

Elevated values for protein associated with an increased number of cells occur in meningitis, aseptic meningeal reactions, neurosyphilis and in the early stages of poliomyelitis. A rise in the level of protein without an increase in the number of cells is found in tumors of the spinal cord and brain, polyneuritis, myxedema and in the late stage of poliomyelitis. This last named phenomenon is termed "albumin-cytologic dissociation."

Sugar is another chemical constituent of importance in the cerebrospinal fluid; the normal range in the cerebrospinal fluid of fasting patients is from 45 to 85 mg. per 100 cc. and the average is about 60 mg. Studies on the relationship of the content of sugar in the blood to that in the cerebrospinal fluid indicate that when the blood sugar increases there is a parallel but somewhat smaller increase of sugar in the cerebrospinal fluid.

In the great majority of cases in which the level of sugar in the cerebrospinal fluid is low, the underlying cause may be acute or subacute meningitis, neurosyphilis or the presence of blood in the fluid. These lowered levels of sugar in cases of meningitis, including that meningitis due to tuberculosis are due to the glycolytic action of the causative organisms. When blood is present in the fluid, the low value for sugar is caused by glycolytic ferments present in the blood. Occasionally, a case of aseptic meningeal irritation

may be encountered, in which the level of sugar is low but in which the cerebrospinal fluid is sterile. This phenomenon is due to entrance of glycolytic ferments into the cerebrospinal fluid because of damage done to the choroid plexus by the inflammatory reaction. In an occasional case of meningitis, a high level of blood sugar by its elevating effect on the sugar level in the cerebrospinal fluid, may mask a relatively great reduction in the sugar content of the cerebrospinal fluid.

Cytology

The average number of cells in the cerebrospinal fluid of normal, healthy persons has not been established definitely, but most investigators agree that more than 5 cells per cubic millimeter rarely, if ever, are present in normal cerebrospinal fluid. The cells normally present are hematogenous, and are chiefly small lymphocytes. From 5 to 10 cells per cubic millimeter should be regarded with suspicion, as it usually means the presence of disease. More than 10 cells per cubic millimeter usually is pathognomonic of disease in the brain or meninges.

The most marked cellular increase occurs in cases of acute purulent meningitis. High counts are encountered less frequently in cases of poliomyelitis, tuberculosis or yeast infection, syphilis or aseptic meningeal reactions. The types of cells found in cerebrospinal fluid in which the cell count is high are the same as those present in inflammatory exudates elsewhere. The cells are hematogenous and may be polymorphonuclears, plasma cells, lymphocytes, and mononuclear phagocytes. The proportions of each type vary with the site and nature of the inflammatory process.

When the cell count is high, the predominating cell usually is the polymorphonuclear leukocyte, which may average 80 to 90 per cent of the total number of cells present. Occasionally there are instances in which the mononuclear cell predominates, and may constitute from 80 to 100 per cent of the cells present even if the count is more than 1,000 cells per cubic millimeter. This condition is encountered in tuberculosis, meningitis associated with mumps, syphilis of the central nervous system, and benign lymphocytic meningitis.

Plasma cells may be found in cases of general paresis, other

forms of neurosyphilis or tuberculous meningitis. Eosinophils are seen occasionally in cerebral cysticerci from infestation with pork tapeworm. Tumor cells are encountered in cases of primary brain tumor or metastatic carcinoma. Myelocytes and embryonic mononuclear cells are encountered in cases of leukemia.

A marked difference in the number of cells found in fluid removed from different parts of the nervous system often is noted. There may be from 5,000 to 10,000 cells per cubic millimeter of cerebrospinal fluid taken from the lumbar region, while fluid removed from the ventricles of the brain may contain only a few cells yet be teeming with organisms. This difference in number is due to stagnation of the fluid in the lumbar region.

Diagnostic Tests for Syphilis

Syphilis of the central nervous system causes elaboration of a specific substance, reagin, which can be demonstrated in the cerebrospinal fluid by the same Wasserman or flocculation reactions used to detect it in the blood. Reagin is an actual substance and is not a vague, general state of the proteins in the serum or cerebrospinal fluid. Evidence suggests that it is an altered globulin which sensitizes the particles of antigen to aggregation by electrolytes, as in the various flocculation tests, and which fixes complement, as in the various modifications of the Wasserman reaction.

Present knowledge leads to the conclusion that the reagin present in the cerebrospinal fluid actually is elaborated as a result of the infectious process in the nervous system, and that a positive flocculation or Wasserman reaction in the cerebrospinal fluid is pathognomonic of syphilis of the central nervous system. An obvious exception, of course, is the case in which a bloody fluid is obtained and the blood test gives positive results.

Most serologists agree that the complement-fixation test is more sensitive than the flocculation test in examination of cerebrospinal fluid for syphilis, although good results are obtained with the flocculation tests if large quantities of fluid are used. Cerebrospinal fluid has only minimal traces of complement and thus does not require inactivation. This obviates any partial destruction of reagin

which might occur by exposure to a temperature of 56° C. Cerebrospinal fluid rarely contains more than traces of natural amboceptor; thus zone reactions attributable to this substance are unusual. Cerebrospinal fluid has a negligible content of protein as compared to blood serum and, therefore, is not as often anticomplementary in its action. This allows the use of five or ten times as much cerebrospinal fluid as serum.

Colloidal Reactions of Cerebrospinal Fluid

The various colloidal tests are entirely nonspecific and thus differ from the tests for syphilitic reagin. In these colloidal tests a finely divided colloidal suspension reacts with tissue protein. Reagin is not necessary to produce a positive reaction. Usually, the inflammatory reaction caused by infection with *Treponema pallidum* causes both the production of syphilitic reagin and an abnormal colloidal reaction. These need not occur simultaneously, however, as evidenced by cases which have a positive Wasserman reaction but which show no detectable changes in the level of protein in the cerebrospinal fluid, either qualitatively or quantitatively. The Wasserman reaction may become negative after treatment but the colloidal reaction may remain strongly positive.

The diagnostic value of the colloidal reactions has been exaggerated. The curve obtained represents the absolute and relative concentrations of albumin and globulin in the fluid. Because of the nonspecificity of this test, it would be preferable to term the curves obtained as "first zone," "midzone" or "end zone," rather than "paretic," "tabetic" or "meningitic."

The mechanism of this test depends in general on the ratio of albumin to globulin and the total content of protein in the cerebrospinal fluid. The globulin fraction is most active in precipitation of the colloidal agents, and the albumin fraction acts as a protective factor against precipitation.

Under normal conditions the content of protein is low and consists almost entirely of albumin. Such a fluid does not cause precipitation because of the protective action of the albumin. If the amount of the protein is increased and it still is largely albumin, no precipitation occurs because the small amount of globulin is masked

by the excess of albumin; if such fluid is diluted beyond the point at which the protective power of the albumin operates, no globulin is left to cause precipitation. If the increased protein is chiefly globulin, the undiluted fluid causes maximal precipitation as there is not enough albumin present to counteract the globulin. When diluted, such a fluid continues to cause precipitation until the globulin is so diluted that it is ineffective.

In intermediate cases in which there is an increase in both albumin and globulin, the undiluted fluid or fluid in low dilutions does not give precipitation because of the protective action of the albumin. In the higher dilutions, albumin loses this faculty and there is still enough globulin present to cause precipitation. In still higher dilutions the globulin is decreased enough so that precipitation no longer occurs. Thus, infinite gradations are possible depending on the total protein and albumin-globulin ratio. There is some evidence which indicates that qualitative changes in the globulin are of some importance. Thus, the globulin which enters the cerebrospinal fluid as a result of infection may be a more efficient precipitating agent than a similar amount of normal globulin.

The colloidal gold test of Lange is probably the best of the many varieties of colloidal tests that have been proposed. There has been some technical difficulty in the past in preparing a simple, efficient and stable reagent. These difficulties can be overcome by using a colloidal gold prepared by the method of Borowskaja.² Add 1 cc. of a 1 per cent solution of gold chloride to 95 cc. of distilled water and heat to 90° C. on a small electric plate. Add 5 cc. of a 1 per cent solution of sodium citrate and boil for one to three minutes. The resulting colloidal gold is clear, stable and does not require titration.

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THE USE OF THE CHICK EMBRYO IN A HOSPITAL CLINICAL LABORATORY*

By LOIS GALLAHER and PAULINE KURACHI

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The chick embryo has been used as a medium for research studies by many workers (1). In March, 1940, the authors undertook to demonstrate that it was also possible to use the chick embryo in the clinical laboratory of the Colorado State Hospital. The early results were described and exhibited at the 1940 annual meeting of the Colorado Society of Medical Technologists. The details of the completed project are now presented.

The method of culturing bacteria on inert media has been in practical use for a long time. Heretofore, the diagnosis of clinical diseases by animal inoculation has required the use of a variety of hosts, such as the mouse, guinea pig, rabbit, etc. The chick embryo enables research workers and commercial houses to use a living, sterile medium, the size, accessibility, and adaptability of which make it ideal for use in the laboratory. In the chick embryo, they have a laboratory animal which is cheap, uniform, self-nourishing, protected from incidental disease. The use of it has enabled them to study the effects of bacteria on a living host and at the same time to cultivate the organism (2). We hope to show that the common chicken egg should have a place in the every-day clinical laboratory.

Greatest of Greek physicians, Hippocrates, by breaking eggs at various stages of incubation, established an experimental method with the chicken egg; and following him Aristotle (3) described the developing chick so well that even today his work arouses the admiration of the embryologists. Beguelin (4) reported his observations of the developing chick embryo before the Berlin Academy in 1749. Gerlach (5) invented the embryoscope, an instrument through

*A.S.M.T. Award Paper (First Award), June, 1943.

which he was able to observe the movements and even the circulation of the embryo. These men, however, were interested mainly in embryology and did not use the chick embryo as a host. Levaditi (6) in 1906 described his continuation of the work begun by Borrel who first infected the chick embryo with the spirillum of fowls. His experiments point out the interesting transfer of immune bodies through the egg from the mother to the baby chick. Rous and Murphy (7) in 1911 published the successful results of inoculating the chick embryo with a fowl sarcoma. In 1929 and 1930, Gay and Thompson (8), Goodpasture and his associates (9) used the chick embryo for the study of virus diseases. Since that time numerous investigators have used the chick embryo for the study of infection, with the practical results that vaccines for several virus diseases, including smallpox (10) and equine encephalo-myelitis (11), and for the rickettsial diseases, Rocky Mountain spotted fever and typhus (12) are now prepared by the propagation of the organisms on the chorioallantoic membrane of the chicken embryo. By bacterial inoculation of the chorioallantoic membrane specific disease pictures have been produced in the chick embryo similar to those found in the human, i.e., pertussis pneumonia (13), influenza meningitis (14) and meningococcus meningitis (15).

Used so extensively and successfully commercially and in research, it seems only logical that this medium should have a definite place in the clinical laboratory. Curious to determine whether or not this same medium might supplement or perhaps in part replace our available tube culture media and laboratory animals, we set out to determine, through working with the tubercle bacillus, whether or not the ordinary technician could master the technic of inoculation and study. Some of the problems which we hoped to answer were:

1. Is it possible to grow the tubercle bacillus on the chick embryo medium?
2. Does it produce characteristic lesions in the embryo or on the chorioallantoic membrane?
3. If it does grow and produce lesions, is this method more specific and quicker than the methods now in use?

Equipment

1. A poultry egg incubator, which was obtained for the nominal sum of \$12.00 (electric).
2. A source of fertile eggs, which was secured from the hospital poultry farm.
3. A device for cutting out a piece of egg shell. In our work the regular dentist disc and dentist drill in the hospital dental office were used. If a drill or motor with a shaft is not available, this work can be done quite successfully with a hand steel trocar (16).
4. A holder for inoculated eggs, which was made by cutting appropriate size holes in a heavy cardboard box cover. These were easily replaced when contaminated.

This is all the apparatus necessary aside from cover glasses, platinum loops, and other material present in any laboratory.

Technic

The technic used in our work was essentially that which is known as the Goodpasture-Budding technic (17).

1. After 3 or 4 days' incubation at 103° F., the eggs were candled, as only those containing live embryo are used. The unfertile eggs were used in making media. (Candling device was furnished with the incubator.)
2. They were candled again before use. It is advantageous to use a 10 to 14-day embryo for inoculation since the younger the embryo the higher the mortality rate.
3. The eggs (10 to 14-day embryos) were opened by drilling a small window, about 2 sq. cm., in the side of the egg with a carborundum disc. Preliminary sterilization of the egg surface is not recommended. The cut is made through the shell only, care being taken not to penetrate the fibrous shell membrane directly beneath.
4. The cut portion was immediately painted over with hot paraffin. This fixed small loose bits of shell and prevented contamination later.
5. The fibrous membrane was penetrated with a sharp sterile knife, the membrane cut along the edges of the window, and the small window of shell and fibrous membrane removed and dis-

carded, thus exposing the chorioallantoic membrane. The chorioallantoic membrane was used for inoculation because it is the first structure presented when the shell and its membrane are removed, it contains cells from all three germinal layers, and the material is readily removed for study as from an agar plate.

6. Inoculation on the chorioallantoic membrane was made in the clinical laboratory and by ordinary bacteriological technic.

7. The window was outlined with a vaseline-paraffin mixture, and a cover slip, sterilized by dipping in alcohol and flaming, was applied, thus sealing the edges.

8. The inoculated embryos were placed in the $37\frac{1}{2}^{\circ}$ C. bacteriological incubator in which our regular bacteriological cultures were running. The embryos were observed daily, the cover slips lifted and smears made with the same precautions taken as for agar plate cultures.

9. When sacrificed or when the embryo dies as evidenced by lack of pulsation in any exposed vessels and lack of movement of the chorioallantoic membrane, the membrane and the embryo were fixed in 10% acetic Zenkers, washed, and preserved in 80% alcohol.

10. Gross sections from the embryo and the membrane were embedded, blocked and cut by the routine method as used at the Colorado State Hospital laboratory for surgical and autopsy tissues.

11. Sections were stained with both routine hematoxylineosin stain and Ziehl-Neelsen's carbol fuchsin stain.

Procedure

Organisms used were a strain of avian tubercle bacilli and a strain of human tubercle bacilli. The avian strain was kindly sent to us by Dr. Wm. H. Feldman. It had been isolated in the fall of 1939 and had been retested for virulence in March, 1940, when it killed rabbits but not guinea pigs. The human strain, kindly sent to us by Dr. H. J. Corper, was strain H 160, regarded as a very virulent human strain. These stock cultures were sub-cultured on Herrolds egg yolk media and inoculations of the chick embryos were made from the fresh cultures.

A series of inoculations and subinoculations of each strain was made by transferring from the fresh stock culture to the chorioallantoic membranes of a set of embryo eggs of the same age (a gen-

eration), and then transferring from a positive chorioallantoic membrane of the inoculated generation to a new generation of embryo eggs. The size of the generation varied from 2 to 10 eggs, the ages of the embryos from 10 to 14 days, and the intervals between inoculation from 3 to 10 days. The human strain of tubercle bacilli was carried through six successive generations, the avian strain through seven successive generations. An initial smear and subsequent daily smears were made from the inoculated chorioallantoic membrane. In the human strain series 10 dead embryos and 13 living embryos, which were from 24 hours to 12 days post-inoculation, were studied bacteriologically and histologically. In the avian strain series 25 dead embryos from 48 hours to 9 days post-inoculation were studied bacteriologically and histologically. Bacteriological studies consisted of culturing material from membrane and mouth of embryo and heart's blood on Herrolds egg yolk media. An accurate record of the results was kept.

Conclusion

The general results of our work were gratifying. The mortality rate of our inoculated embryos was in general attributable to the infection rather than to the technic or equipment. Embryos were rarely lost in less than 48 hours. There were remarkably few contaminations, none of which became generalized.

The specific results of our work were encouraging. In this preliminary investigation we found from the examination of the smears that the chorioallantoic membrane was a good culture medium for the strain of avian tubercle bacillus and that the cultural growth of the H 160 human tubercle bacillus on the chorioallantoic membrane was questionable; in fact, in the latter the inoculum seemed to disappear and a positive surface became negative. Specific lesions in the nature of giant cells and tubercles were found in membranes inoculated with the human strain, and the histological findings in general were in agreement with those in recent publications (18, 19, 20). However, specific lesions were not consistently produced. A few positive cultures were obtained from the heart's blood of embryos the membranes of which had been inoculated with the human strain, but no specific lesions were found in any embryos of either the human or avian series.

Our work was of too preliminary and brief a character to permit generalizations, but it has led us to believe that the chick embryo should have a place in the clinical laboratory, where in our experience it can be used satisfactorily by technicians in the same manner as inert media and laboratory animals are used.

The authors wish to express their appreciation of the encouragement and advice of Dr. Mae Gallavan in the initiation and carrying out of this study.

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THE BATTLE OF THE AMAZON

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The dominating physical fact about Brazil is that it is BIG. With an area of 3,300,000 square miles, it is the fourth largest country in the world, exceeding the territorial span of the United States. It covers nearly half of the South American continent. It is larger than Australia, approximately four-fifths the size of Europe.

And because it is so big, so varied in resources, so relatively undeveloped, it is difficult to talk about Brazil in generalities. It is particularly difficult to draw conclusions about one of the major features of the vast Brazilian expanse—the Amazon River basin. Even in a big country like Brazil, the Amazon basin stands out. The Amazon and its tributaries make the greatest river system in the world. The Amazon is navigable by large vessels more than 2,000 miles upstream, all the way from Belem at the mouth to Iquitos, Peru. The Amazon drains an area almost as large as the United States. This area holds the greatest tropical forests on earth. A large portion of the basin is lowland, flooded part of the year. The Amazon frequently has been called the last great frontier of the Americas. Many regard it as a virgin land of promise. Others view it as a frontier of limited economic possibilities because of the heat, humidity, floods and uncertain agricultural prospects.

Since Spanish explorers first travelled the river more than 400 years ago, the promise of the Amazon has haunted many men. While great fertile lands were available in the temperate zones of North America and South of the Amazon, while the mineral riches of the Andes were more tempting, the Amazon basin attracted relatively few settlers. In 1940, the great state of Amazonas, with an area of 731,000 square miles, had an estimated population of only about 450,000. Whether the sparsely-settled Amazon basin some day would be able to receive the population overflow of more crowded areas of the world has prompted debate for generations. Today this debate on Man versus the Amazon holds more than

academic interest. For, among the big facts about the Amazon, is the fact that it is the largest source of natural rubber immediately available to the United Nations. The Amazon basin generally is conceded to hold uncounted millions of wild rubber trees. Before the rise of the plantation rubber industry in British Malaya and the Netherlands East Indies, the Amazon basin was the world's chief source of rubber. At the peak of this production, prior to the First World War, the Amazon basin yielded between 40,000 and 50,000 tons of rubber annually. Now the inter-American rubber development program aims to expand production to around 70,000 tons in 1944 to help cover the loss of rubber supplies in the Far East. This is only a fraction of the rubber formerly imported from the Far East. Yet this goal involves the biggest battle of man with nature the Amazon jungles have seen. The drive for production in the primitive Amazon country may not be as spectacular as the fighting on the war fronts. Still it is an heroic struggle of man against obstacles of nature.

The Amazon basin largely is a primitive country of dense forests, few roads and trails, of equatorial heat. It has one railroad of note. This is the celebrated Madeira-Mamore Railroad, a 228-mile feat of rail construction through the jungle from Porto Velho to the Bolivian border. It was completed just before the collapse of the first rubber boom to by-pass cataracts and rapids which obstructed river navigation. The construction of this road deep in the Amazon jungles at high cost in human life and toil emphasizes the basic fact about transportation in the Amazon basin. The mighty river itself and its numerous tributaries have been the main avenues of travel and trade.

Meanwhile, since the peak of the first Amazon rubber boom, the airplane has become a swift carrier of passenger and freight. Today the airplane aids man in his struggle against the jungle. By new air routes from the United States, one flies over the green roofs of the forests to the capital of the Amazon rubber country, Manaus, at the junction with the Rio Negro, 1,000 miles upstream. I made this sky trip to Manaus in two days. Straight over jungle buttes, dense forests with outcroppings of granite cliffs which looked like A. Conan Doyle's "*Lost World*," flew the transport plane. With

the aid of radio bearings, we navigated the uncharted sea of forests, through stretches of tumbling clouds, until finally the plane dropped down to the dark waters of the Rio Negro at Manaus. And, in the capital of the Amazon rubber country, we sensed the stir of the new battle to get rubber from the jungle and to make the Amazon frontier yield to the will of determined men.

At Manaus the drive for rubber brings into focus the inter-American aspects of this great enterprise. Here, at the docks to meet us, were representatives of United States agencies working closely with Brazilian organizations. These include indispensable organizations of health services and food supplies for the Army of tappers who will be required for increased rubber production. At the Manaus dock were Reid Chambers, in charge of the U. S. Rubber Development Corporation's work in the Amazon; Dr. George M. Saunders, in charge of health and sanitation work for the Institute of Inter-American Affairs; Dr. Kenneth C. Waddell, formerly of the Ford rubber plantations in Brazil, now aiding Dr. Saunders in the Amazon health work; Ken Kadow and Ted Haack, also representatives of the Institute of Inter-American Affairs, working with Brazilians on food supply. And there were others from the United States, working side by side with Brazilians in the battle of the Amazon. These doctors, engineers and agriculturists are the spearhead of the large forces of men who will be needed if we are to get any substantial supply of rubber from the Amazon.

For the Amazon presents a manpower problem as compelling as the manpower problem on our own production fronts in the United States and on the fighting fronts overseas. Every extra ton of rubber from the Amazon requires an additional man or two for the trails to the scattered wild trees, for the handling and shipment of the rubber to ports downstream. Without men to tap the wild trees and to move the rubber, the Amazon basin will remain what it has always been—a land of promise. Now the urgent need for rubber is bringing men into the Amazon, thousands of them. But still unanswered is the old question of whether this last great frontier of the Americas at last is to be tamed by man, with the aid of modern medicine and sanitation, organized food supply and jungle-vaulting airplane.

From Belem, at the mouth of the Amazon, to Manaus and Porto Velho you will hear men debating the question: is the promise of the Amazon about to come true? As a newcomer, I listened to the old-timers of the Amazon discuss this question. With my own eyes, I could see the obvious difficulties of colonization: the forests, the flooded lowlands, the rise and fall of the rivers, the rainy season, the difficulties of transportation and food supply, malaria. At the same time, I knew the forests, besides rubber, held large reserves of vegetable oils, edible nuts, hardwoods. I listened to claims of the Amazon boosters that there are mineral reserves and stretches of good land suitable for agriculture. I heard the argument that once men began to move into the Amazon in larger numbers and to make the forest yield their natural wealth, agriculture would follow and provide food for the increased population. History will decide this debate. Meantime, the drive for rubber goes on.

The quest for rubber has brought the greatest health and food supply programs yet attempted in the Amazon. In this work the Institute of Inter-American Affairs, an agency of the Office of Inter-American Affairs, is cooperating with special agencies set up by Brazil, Bolivia, Peru, Colombia, Ecuador. In all these countries organization of health services proceeds in the vanguard of the Amazon rubber development. It is an inter-American undertaking to which the Amazon Basin countries and the United States contribute funds, doctors, sanitary engineers, workers and materials toward the common goal of making the rubber country more habitable for man. Malaria, especially, menaces human life in the Amazon. Here the mosquito is a more dangerous foe of men than bullets. Malaria-carrying mosquitoes breed in stagnant pools left by receding waters of the Amazon floods. Energetic sanitation measures can make centers of habitation in the tropics fairly secure against the ravages of malaria. On the grandiose scale of the Amazon basin, malaria control is a health problem of the first dimension. That explains in part why the Rio de Janeiro conference recommended special cooperative health measures to support economic development of hemisphere resources.

In the Amazon, I found the health and sanitation work well

advanced. It began last year, soon after the Rio conference. Dr. Saunders and his aides went to Brazil in the spring of 1942 to work with Brazilian health authorities on the Amazon project. Now twenty medical posts have been opened for treatment of the sick. The Amazon work involves the establishment of a chain of hospitals, medical centers, sanitation works running from Belem, at the mouth of the Amazon, to the forested lowlands east of the Andes in Bolivia, Peru, Ecuador, Colombia. Already in remote reaches of the Amazon ply launches which operate as floating dispensaries carrying doctors, nurses and medical supplies to the rubber workers and their families who live far off the beaten paths of civilization. By the end of 1943 Brazil's SESP, a special agency set up for the health and sanitation work, expects to have a total of fifty infirmaries in operation in the Amazon basin. These will provide the best medical services which ever have been available to the rubber workers. They are a long step forward from the days when the humble rubber tapper battled raw nature in the Amazon without benefit of doctors, nurses, modern drugs and organized food supply. If man conquers this last big frontier of the Americas, certainly he will owe much to the progress of tropical medicine. The lessons the Americas have learned in tropical medicine since the first Amazon rubber boom now are being applied in the attempts to make the Amazon forests more hospitable to man.

From Manaus, I flew in an amphibian transport, heavily loaded with supplies, more than 1,000 miles upstream to Iquitos, headquarters of Peru's health work in the upper Amazon. And there I saw an example of what the doctors and engineers are doing to overcome wartime shortages. Indispensable supplies move in part over the Andes ranges by highway, airplane, canoes and river transport before they finally are laid down in Iquitos. The engineers, consequently, are relying as much as possible upon local materials and equipment. One hospital construction job in Iquitos was being carried out almost entirely with locally-made supplies, including furniture, bricks and tile. Even the hospital blankets were obtained locally. Cedar and mahogany from nearby forests were being used.

Hospital launches were being constructed from the local cedar,

with excellent workmanship. One of these launches is named the Nelson A. Rockefeller. It was under construction in a loft two miles from the river. Another of the hospital launches constructed locally is in operation. It is named the General George C. Dunham, after the director of the Health and Sanitation Division of the Institute of Inter-American Affairs. These launches are spotlessly clean. They carry a crew consisting of the captain, mate, engineer and deckhand, in compliance with Peruvian law. Like the heavily-laden air transports which bring doctors and medicines, these hospital launches are symbols of the new struggle to wrest rubber from the Amazon forests with the aid of modern science and technology. If the Amazon frontier is ever to be tamed by man, it will have to be done with the aid of modern medicine, air transport, refrigeration, organized agriculture, machinery. The machine can fly over the jungle or batter it down to make way for motor transport and for healthful urban centers. The machine has yet to test fully the resistance of the Amazon country.

In the upper Amazon reaches, Brazil is calling upon the machine for aid in opening the country for colonization. This region includes some of the best rubber-producing forests in the Western Hemisphere. By river transport, it is hard to reach. But airports and roads will help open this country. Some rubber men claim it is the finest area for Hevea rubber in the world. This is where the machine counts when man braves the forests.

In the upper Amazon, the food problem also has to be overcome before men in any large numbers can be expected to settle there to gather rubber. Little food has been raised around the towns. The soil in many places is covered with dense jungle and is bleached out. Vegetables are brought down from highlands on rafts. Wheat flour has been imported into Iquitos from the United States. What this means during the scarcity of shipping is obvious. Under these conditions, food to nourish the workers becomes just about the number one problem of increasing rubber production.

Ordinarily food could be shipped from surplus-producing areas of the hemisphere. Now the shipping shortage makes increased local food growing expedient in the Amazon, as in other hemisphere areas which have imported food. Brazil's migration of workers into

the rubber-producing regions, conceived with the goal of adding at least 50,000 workers, brings a very substantial food supply problem. Moreover, in the heat and humidity of the tropics, it is harder to store and preserve foodstuffs than in cooler and dry climates. Increased local food production is needed, certainly until more ships are available. And this is the approach in the work going on in northern Brazil to increase food production under a joint Brazilian-United States commission.

Even in areas flooded part of the year, there are high spots suitable for growing corn, rice, beans, sugar, vegetables and other staples. Additional land can be worked when the floods recede. I saw an example of this on an island near the junction of the Negro and Solimoes Rivers. In high water this land is inundated. The water covers it with a fertile silt. When the water recedes in June, the cleared land can be planted to the low water mark. This allows six to seven months in which to grow crops. In fact, arrangements have been made for increased planting of food crops on the island this year.

Seeds and tools are being distributed to farmers and natives to stimulate food production. Seeds are being distributed in the Rio Branco, Acre and Porto Velho areas, all regarded as potential sources of increased rubber tapping. When I was in the Amazon country, arrangements were being made for introducing plows in the Santarem area. The idea is to work units of men, plows, harrows and animals for loan to farmers. These units will plow for the farmers. And the farmers will receive lessons in the use of the plow. Provision also was being made for the storage of crops, including the sending of silos to food-producing centers. Production of food is only one step in a program directed toward maintenance of food supply in the Amazon. Of equal, and sometimes greater, importance are transportation and storage. This necessitates setting up of warehouses and refrigeration facilities to preserve food.

The food program in Brazil goes beyond the Amazon country and covers production for strategic defense areas, for regions producing strategic materials other than rubber. It includes large-scale victory gardening, distribution of seeds and tools to thousands of

farmers in northern and eastern states of Brazil. By latest reports, these measures are bringing about a considerable increase in acreage sown to food crops. But in the Amazon battle food holds special interest. If an army of fighting men moves on its stomach, so does an army of rubber tappers. Traditionally the rubber tapper has lived partly or wholly off the countryside. He has lived by shooting game, by fishing and foraging for edible wild plants. The hunting rifle and fishing gear are still part of the standard equipment of an Amazon rubber tapper. At best this is an uncertain way of life and it does not operate for maximum production of rubber. A man who has to spend part or most of his day hunting and fishing to keep alive cannot be expected to become a maximum rubber producer. An empty stomach and malaria are drawbacks to human efficiency in the Amazon rubber country. At the outset, it is impossible to produce locally all the food requirements for the rubber program. It takes time and organization to increase food supply over so vast an area and on so large a scale. Still a start has been made and the results may count heavily in the outcome of man's battle with nature in the Amazon.

ABSTRACTS

AMINO ACID NITROGEN OF NORMAL HUMAN PLASMA: F. B.

Cramer, Jr. & T. Winnick, Jr., *Biol. Chem.*, Vol. 151, No. 1, Sept. '43, p. 259.

Ten male and 10 female adult convalescent patients were used as subjects. All had normal N.P.N. and urea N levels. Blood was drawn after a 12-hour fast, oxalated and centrifuged at once. Uric acid was determined by the gasometric ninhydrin-CO₂ method of Hamilton and Van Slyke. The average value obtained for the group was 4.2 mgs. of alpha-amino nitrogen per 100 ml. plasma.

PROTECTIVE ACTION OF SULFANILAMIDE AGAINST HEPATIC DAMAGE FROM CHLOROFORM INHALATION:

J. C. Forbes, E. I. Evans, *War Med.*, vol. 4, No. 4, Oct. '43, p. 418.

Because chloroform is less bulky and is not inflammable, it is being used in combat areas and on board ship where other anaesthetics would be more hazardous. This study was undertaken with a view to observing whether the sulfonamides would tend to prevent the liver damage so frequently resulting from its use.

Approximately 30 mg. of sulfanilamide per 100 g. body weight were given to rats on two successive days. Two or three hours after the second dose, they, and an equal number of control animals were gassed in the same chamber for 2½ hours. Twenty-four hours later they were sacrificed and comparative studies made on sections of the liver. As many of the rats had apparently died of causes other than liver damage, the work was repeated using rabbits. These were more satisfactory. Only in one instance did a treated animal show hepatic damage of as great degree as the least affected control animal.

Since sulfanilamide was found to exert a protective action against liver damage in both rats and rabbits, early administration of the drug seems advisable so that a therapeutic level may be obtained before the inhalation of chloroform.

ERRORS IN MASS BLOOD GROUPING AND METHODS OF MINIMIZING THEM: E. L. DeGowin, *War Med.*, vol. 4, No. 4, Oct. '43, p. 410.

The rate of error for five individuals doing mass typing of blood for a military establishment showed a range of 1.0% to 7.1%. Further examination disclosed that as the same cell suspensions were used and frequently the same typing serum, the errors must be attributed to the individual examiner and not to technique or defective sera. False positives were higher when slides were read microscopically. Errors in transcription were less when the readings were recorded as plus or minus and the grouping determined later.

The author concluded that no laboratory worker could make mass blood groupings without errors due to the personal equation. These could be minimized by two separate collections of blood and two separate determinations of group. Discrepancies could then be checked.

The open slide technique was satisfactory if high titre sera were used and readings made after 30 minutes at room temperature.

TREATMENT OF BACILLARY DYSENTERY CARRIERS: R. J. Hoagland, F. H. Harris & R. B. Raile, *War Med.*, vol. 4, No. 4, Oct. '43, p. 400.

Forty-five carriers of *S. paradysenteriae* were studied. These had shown only intermittent positive feces cultures. In five cases, three negative cultures were obtained before a positive and in two cases, as many as five negative cultures before a positive.

Rectal swabs were found to give a higher percentage of positive cultures than excreted feces. Media used were "SS" agar and desoxycholate citrate agar.

Thirty patients were given 20 g. sulfaguanidine daily for six days and 15 were given 20 g. succinylsulfathiazole for six days. Cultures were begun four days after cessation of therapy and at least nine consecutive negatives were taken as the criterion of cure.

A total of 503 cultures were examined. Each patient showed the disappearance of dysentery bacilli. No toxic reactions occurred with either drug but the succinylsulfathiazole gave rise to minor local discomforts.

A CASE OF VITAMIN D DEFICIENCY ASSOCIATED WITH CIRRHOSIS OF THE LIVER AND A DYSCRASIA OF CALCIUM AND PHOSPHORUS METABOLISM: H. F. Fraser, Jr. *Ped.*, vol. 23, No. 4, Oct. '43, p. 410.

The author presents a detailed study of a boy of 18 years known to have had severe rickets all his life. Calcium and phosphorus metabolism studies were undertaken at 18 years with the following pertinent findings: 1. low serum phosphorus (2 mg. per 100 cc.); 2. high serum phosphatase (10.5 Bodansky units); 3. endogenous excretion of calcium in grams per kilo was twice normal; 4. Ca-P balances were not influenced by the vitamin D therapy given and the clinical picture remained unchanged; 5. Ca-P excretory ratios were reversed; 6. normal serum calcium levels.

The patient died of tuberculosis at 19 years. At autopsy a cirrhosis of the liver was found. Early physical examination record suggests this may have been present at age two years.

Animal experiments indicate that in the presence of changes in the liver, much larger (2-12x) as much vitamin D might be necessary to cure rickets.

Though it was not possible to find any hyperplastic parathyroid tissue at autopsy, there is a possibility that some may have been aberrant in position. Its presence would explain a number of the findings.

THE EFFECT OF ESTROGENIC HORMONES ON THE BACTERIAL CONTENT OF THE UTERUS: L. Weinstein, W. V. Gardner & E. Allen, *Yale Jr. Biol. & Med.*, vol. 16, No. 1, Oct. '43, p. 43.

In untreated control mice, positive cultures were obtained in only two of 41 mice. Administration of estradiol benzoate, stilbestrol or triphenylethylene produced high percentages of positive cultures in from two to 10 days after injection. The organisms found were essentially the same as those of the vagina. Cultures of the blood and spleen were negative.

Whether this treatment provides a more favorable environment for bacterial growth in the uterus or whether it actually increases the entrance of bacteria into the uterus has not been established.

ABDOMINAL PUNCTURE AS A DIAGNOSTIC AID: C. M. Henry & C. F. Vale, Surgery, vol. 14, No. 4, Oct. '43, p. 574.

The site for tap is chosen in regard to the clinical impression. Novocain is infiltrated and an 18-gauge needle slowly inserted.

Four cases are reported in which examination of the fluid helped to establish the presence of visceral injury without trauma to the outer wall. Three revealed bloody fluids with the following surgical findings: large bleeding tear in the liver, laceration of the mesentery and ruptured spleen. The fourth case gave a turbid yellow fluid with few leucocytes and many bacteria. This accompanied perforation of the sigmoid.

Two more cases showing bloody fluid were found to be respectively, a ruptured ectopic pregnancy and spontaneous bleeding of a carcinoma of the liver.

Turbid brown fluid with cholesterol crystals was found associated with a subhepatic accumulation of "white bile" and a thick-walled gall bladder containing no calculi.

Viscid pale yellow fluid was associated with perforation of a peptic ulcer.

A shot case with extensive intestinal repair showed abdominal swelling five days later. Abdominal tap gave a bloody tinged fluid unmistakably urine.

The tapping of the abdomen is reported comparatively safe as it would be difficult to perforate the intestine with the amount of pressure ordinarily used in tapping.

CHEMICAL TREATMENT OF TUMORS. V. Isolation of the Hemorrhage-Producing Fraction from *Serratia marcescens* (*Bacillus prodigiosus*) Culture Filtrate: M. J. Shear & F. C. Turner, Jr., Nat. Can. Inst., vol. 4, No. 1, Aug. '43, p. 81.

The medium used for growth of *S. marcescens* was a synthetic medium composed of a solution of potassium acid phosphate, ammonium chloride, ammonium sulfate and glucose. The organisms were removed, the active agent precipitated with chloroform and purified and concentrated by repeated precipitation with ethyl alcohol and by dialysis. The material was assayed. The lethal dose was found to range from 100 to 1,000 times the hemorrhage-producing dose for the various preparations made.

FURTHER OBSERVATIONS ON THE LOWERING OF BLOOD URIC ACID BY URICASE INJECTIONS: E. H. Oppenheimier & H. G. Kunkel, *Bull. Johns Hopkins Hosp.*, vol. 73, No. 1, July '43, p. 40.

The enzyme uricase is extracted from pig's liver, taken up in M/10 borate buffer at pH 10, sterilized by filtration and used for injection. It has remained active at least 2 months when frozen and stored at -28°C . Protein sensitivity tests on guinea pigs were negative.

Chickens made "gouty" by a high protein diet were used as the test animals. Injection of the enzyme sharply reduced the plasma uric acid levels even when the high protein diets were continued. Occasionally, the enzyme failed to have the desired effect. Factors responsible were not determined.

THE OCCURRENCE OF SULFONAMIDE-RESISTANT PNEUMOCOCCI IN CLINICAL PRACTICE: H. Hamburger, L. H. Schmidt, C. L. Sessler, J. M. Rueggsegger & E. S. Grupen, Jr., *Inf. Dis.*, vol. 73, No. 1, July-Aug. '43, p. 12.

Sulfathiazole, sulfapyridine and sulfadiazine were used. Pneumococci which were highly resistant to sulfonamides were rarely found in untreated patients. High resistance to the drug was rarely developed when treatment was brief but when the therapy was prolonged as in endocarditis or slowly resolving pneumonia, resistant pneumococci generally developed.

STUDIES IN ELECTROPHORESIS OF CELLS AND MICRO-ORGANISMS. A New Macro-electrophoresis Apparatus and Method for Regional Isolation of Protozoa from Bacteria and for Studies of Electrical Charge and Velocities of Filterable Viruses: A. Packchianian, *Tex. Rep. on Biol. & Med.*, vol. 1, No. 2, Summer '43, p. 157.

Detailed descriptions with diagrams are given for four types of macro-electrophoresis apparatus. These can be sterilized by autoclave or dry oven. The advantages of each are presented. After the current has been allowed to pass for the desired length of time, the current is shut off and the liquid removed from each cell may be cultured, used for microscopic study or for animal inoculation.

EXPERIMENTAL STUDIES ON BLOOD SULFANILAMIDE LEVELS ATTAINED AFTER POWDERED DRUG ADMINISTRATION BY INHALATION: H. Romence & H. N. Harkins, Proc. Soc. Exp. Biol. & Med., Vol. 54, No. 1, Oct. '43, p. 8.

This work was undertaken to observe what dangers of over-absorption there might be in the administration of sulfa drugs by inhalation. In the first observations, dogs were anesthetized with nembutal and a flannelette bag was tightly tied over the snout. A blow bottle containing the drug in crystalline form was attached to the bag and air blown in by means of a pump. Maximum blood sulfanilamide levels obtained this way were 2.3 and 2.4 mg. /100 cc. The two dogs lived and showed no ill effects.

The work was repeated with 3 more dogs but instead of the flannelette bag, a catheter was connected with the bottle and the other end inserted into the trachea. Maximum blood sulfanilamide levels obtained this way were 33.2, 33.2 and 12.2 mgs. /100 cc. Urinary levels up to 1600 mgs. /100 cc. were obtained. Indications of irritation of the trachea and bronchi were observed.

VIABILITY OF TREPONEMA PALLIDUM IN STORED PLASMA:

F. R. Selbie, Brit. Jr. Exp. Path., Vol. 24, No. 4, Aug. '43, p. 150.

Rabbit plasma was heavily inoculated with rabbit testicular chancre tissue. Darkfield examination of the mixture showed an average of 10 free spirochetes per field. The sample was apportioned in 3 tubes and stored at 5°C. Successive tubes were removed on 3, 4 and 6 days. The plasma was centrifuged and rabbits were given testicular inoculations of the sediment and the supernatant plasma. Positive results were obtained even after 6 days' storage. The conditions of this experiment which tend to make the findings higher than those expected in the transfusion of infected human plasma were: 1. greater number of organisms than would usually be present in circulating blood; 2. plasma was injected into a sensitive tissue rather than into the blood stream where the normal protective factors of the host might have been effective.

Under ordinary conditions, the danger of transfusion syphilis from stored blood has been extremely small.

THE WARTIME INCREASE IN TUBERCULOUS MENINGITIS IN RELATION TO INFECTION FROM MILK: E. M. Williams & R. L. Milne, *Tubercle*, Vol. 24, No. 7, July '43, p. 113.

In explanation of the increase in deaths from tuberculous meningitis among small children (in the British Isles), two factors are obvious. Large scale evacuation of children would presumably increase their contacts with the human type and an increase in frequency or degree of milk contamination would increase the bovine type. Though the authors state that this report is not comprehensive enough in itself to form the basis for definite conclusions, it does show an absolute increase in the number of cases of bovine origin which they believe might have been prevented by pasteurization of milk.

SEROLOGICAL CHANGE OCCURRING DURING SHORT COURSES OF NEOARSPHENAMINE AND BISMUTH, SUCH AS WERE POSSIBLE WHILE PATIENTS STAYED AT A VENEREAL DISEASES CENTRE FOR AFRICAN SOLDIERS: W. A. Young, *Brit. Jr. Derm. & Syph.*, Vol. 55, No. 8, Aug. '43.

The author observed that treatment in the early stages of primary cases was usually accompanied by an increase in the degree of positivity of the Kahn. This was especially true in infiltrated primary cases in which the Kahn reading was weakly positive.

LOEWENSTEIN'S MEDIUM: AN IMPROVED METHOD OF PREPARING IT: R. G. Kelly & E. A. Murphy, *Am. Rev. Tub.*, Vol. 49, No. 1, Jan. '44, p. 110.

The authors found that by inspissating Loewenstein's medium only once instead of the usual twice, a more moist medium was obtained and this yielded more positive cultures. The method proved satisfactory until on the introduction of a new package of potato flour, 50% of the tubes showed contaminants. This was remedied by putting the 15 g. of potato flour in a small beaker, covering with a watch glass and heating in a hot-air sterilizer at 130°C. for 2 hours. The medium was prepared in the usual manner with a single inspissation. The contaminants were eliminated.

THE COMPARATIVE EFFECTS OF AMMONIATED MERCURY, SULFATHIAZOLE, AND SOAP AND WATER ON THE SURFACE BACTERIA OF THE NEWBORN INFANT: W. R. MacLaren, Jr. *Ped.*, vol. 23, No. 4, Oct. '43, p. 446.

This study compares the effects of ammoniated mercury and sulfathiazole ointments with soap and water and of soap and water alone. Skin cultures were made by spreading a drop of sterile broth over an area approximately 5x10 mm. with a stiff wire loop and, when the loop was lifted, spreading the adherent broth over one-half of a blood agar plate. Incubation was at 37°C. 18-24 hours. Growth was reported as "none," "few," "moderate," or "abundant." Cultures were taken behind the ear, on the front of the neck, in the groin and on the face.

Results showed that soap and water baths every other day were not effective in reducing the total numbers of bacteria on the newborn skin. Both of the drugs reduced *S. albus* more than did soap and water but soap and water was somewhat more effective against *S. aureus*. Sulfathiazole was most effective against beta hemolytic streptococci and ammoniated mercury was most effective against non-hemolytic streptococci. Blood determinations showed that sulfathiazole was not absorbed by the intact skin of the newborn and no skin irritation accompanied its use.

Assuming that pathogenic organisms would react as did the non-pathogens on these healthy infants, the three types of treatment observed would rank in order of preference: 1. sulfathiazole, 2. ammoniated mercury, 3. soap and water alone.

BOOK REVIEWS

METABOLISM MANUAL, by Jessie K. Lex, R.T., M.T. (A.S.C.P.).
The Waverly Press, Baltimore, Md., 1943, pp. 56. Price \$1.75.

Within the scope of 56 pages the author has presented and discussed the technical and mechanical aspects of basal metabolism with pertinent interpretations. Reflecting on the instructions for preparing the patient the Reviewer subscribes to the fundamentals, particularly as regards a bed for the patient in contrast to an uncomfortable examining table, the regulation of light and ventilation in the test room and lastly making the patient physically and mentally at ease. What the author describes is a sound technic for determining basal metabolism rather than a method for obtaining a "metabolism test."

The technician as well as clinician would do well to review this manual of procedure, provide it for guidance and refer frequently to its discussion of the neglected angles of mechanics, graph censorship, care of patient and rules of interpretation. It is concise, contains illustrative graphs and in every respect promotes greater precision in an important clinical test.

MEDICAL RADIOGRAPHIC TECHNIC, by Glenn W. Files, and
Members of the Technical Service Department of General Electric
X-ray Corporation. Published by Charles C. Thomas, Springfield,
Illinois, 1943, pp. 364. Price \$6.00 Postpaid.

In order to enhance the diagnostic value of all medical and dental radiographs Director Glenn W. Files and his able staff of seventeen collaborators have prepared the subject matter in the above-captioned volume.

This text provides a new and informative discussion of the fundamentals and controlling factors for the generation of electrical energy particularly with respect to high voltage currents in X-ray. Further, positioning and agglutination of the x-ray table in relation to the part under examination as well as the positioning of the patient are covered elaborately and precisely. Thirty full-page plates reliably depict the anatomical landmarks and nature of the soft tissues

encountered in most radiographic procedures. The over-all design of the book, to offer a comprehensive knowledge of the interrelated factors contributing to the diagnostic value of radiographs, has been ably achieved. There are 118 plates on positioning and technic showing 237 illustrations and 83 drawings on electric currents, mostly in two-colors, in addition to the above-mentioned 30 full-page anatomical plates. The print, paper, format and index all subscribe to the publisher's thought and attention to reader comfort.

MEDICAL PARASITOLOGY AND ZOOLOGY: By Ralph Welty Nauss, B.Sc., M.D., Dr. P.H., Assistant Professor of Public Health and Preventive Medicine, Cornell University Medical College; Consulting Parasitologist, New York Hospital; Fellow American Public Health Association; Lieutenant Colonel and Flight Surgeon, Medical Reserve Corps, United States Army. Foreword by John C. Torrey, Ph.D., Professor (Emeritus) of Epidemiology, Cornell University Medical College. Publishers, Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York and London. Price \$6.00.

Parasitic diseases will be much more common in the North American Continent as more and more members of the Armed Forces return from foreign countries. The recognition of these various diseases will be the responsibility of the medical and allied professions. This text of Medical Parasitology and Zoology is not only timely in its publication but is authoritatively written. Part I takes up the protozoa parasitic in man and includes the amoebae, flagellata and the diseases caused by blood and tissue flagellates, the sporozoa, the malaria fevers and a pathogenic ciliate. Part II includes the worms parasitic in man. Part III has three chapters under the arthropods and disease transmission by mosquitoes, flies and other arthropods such as lice, fleas, ticks, etc. Part IV takes up the poisonous and venomous forms of arthropods to include various insects, water inhabiting groups and snakes, lizards and vipers.

Where possible the clinical and differential diagnoses are given as well as symptoms, pathogenesis, treatment, prognosis, prophylaxis and epidemiology. The text is simply and clearly written and is practical presentation adaptable to both instruction and ready reference. It supplies the specific needs of the clinician, the medical student, the teacher and the technician alike.

NEWS AND ANNOUNCEMENTS

MINNESOTA

Dorothy Schommers, president of the Minnesota Society of Medical Technologists, has appointed the following committee chairmen to assist her for the business year 1943-1944:

Chauncey Winbigler.....	Charter and By-laws
Margaret Keogh	Nominating
Bernice Medley.....	Standard and Studies
Esther Wilbrecht	Education
Mary Conroy	Convention Program
Frieda Claussen	Membership

The following statement is a guess on the part of the reporter but I make the guess with a certain degree of confidence: Frieda Claussen has become poetic and here is the evidence:

HELP WANTED!

Send the treasurer dues!
Send the editor news!
And always try to remember—
That the M. S. M. T.
(Meaning both you and me)
Can always use a new member!

Then there follows a letter that should be productive and to it she signs her name:

"Dear Techs:

The Minnesota Society of Medical Technologists is a GRAND Society. It has made big strides and has made a name for itself among state societies of the nation. We're way at the top because

we are properly organized, properly affiliated, properly incorporated, and one of the few states to edit a paper!

But we're a little delinquent in one thing and that is membership. Trust me to fall back on statistics again. Can you bear it once more? Here goes!

There are over 200 registered (ASCP) medical technologists in the State of Minnesota.

Less than half of these (only about 85) belong to the State Society. (The state membership was once over 100—why has it dropped?)

Only about 25 of these belong to the National Society. (We are allowed only one delegate for 25 members at the National Society Convention. We need more—why should we have such a small vote?)

Well, that's enough on statistics to show where we stand. If every state member made it his business to get one new state member this year, we would have a membership of which we could justly be proud. The form letters I have sent (over 100 of them) are only the thin end of the wedge. It is personal contacts that help most. Won't you all do your bit?

Most of you have been grand about prompt payment of dues. Delinquent dues and second notices cost us money. Third notices cost us more money. The editor keeps sending the paper to delinquent members a whole year after non-payment of dues. That costs us more money. Don't be a drag on your society.

And PLEASE notify us of changes of address—your own and any others you may know of.

Frieda H. Claussen, Chairman

Minnesota A.S.M.T.

Membership Committee."

STATE AND LOCAL SOCIETIES

Program of the Tri-State Hospital Assembly, Section of Medical Technologists. Sponsored by the Chicago Society of Medical Technologists, Illinois Society of Clinical Laboratory Technicians and Wisconsin Association of Medical Technologists.

Wednesday, May 10th, 1944—

12:30. Luncheon of the Wisconsin Association of Medical Technologists.

Session beginning 2:00 P.M.

Miss Alice Thorngate, President, Wisconsin Society, presiding

1. Dr. H. E. Cope, Clinical Pathologist, Bureau of Laboratories, Michigan Department of Health, Lansing. "The Development of the Training of Laboratory Personnel."
2. Dr. Norbert Enzer, Director of Laboratories, Mt. Sinai Hospital, Milwaukee. "Introduction of the Study of Bone Marrow."
3. Dr. R. E. Cummings, Pediatrician, St. Bernard's Hospital, Chicago. "The Laboratory in Relation to Pediatrics and Diagnosis."
4. Dr. Arthur R. Colwell, Evanston Hospital, Evanston. "Therapeutic Aspects of Diabetes Mellitus."
5. Dr. S. B. Pessin, Director of Laboratories, St. Mary's Hospital, Madison, Wisconsin. "Hormone Pregnancy Tests."

Thursday, May 11, 1944—

Session beginning at 2:00 P.M.

Miss Jessie Lex, President, Illinois Society, presiding

1. Dr. J. Garrott Allen, Department of Surgery, Univ. of Chicago Medical School. "The Determination of Pro-thrombin in the Blood."
 2. Dr. Earl Bigg, Dept. of Medicine, Northwestern Univ. Medical School. "Control of Air-borne Infections."
 3. Dr. Israel Davidsohn, Pathologist, Mt. Sinai Hospital, Chicago, and Member of the Board of Registry of Medical Technologists. "Technique of the Determination of Rh Factor and Anti-Rh Agglutinins."
 4. Dr. Lall G. Montgomery, Chairman, Board of Registry of Medical Technologists. "Present Registry Problems."
- 4:00. Business Meeting, Illinois Society of Clinical Laboratory Technicians.

The American Society of Medical Technologists will convene in Chicago, June 10, 11, 12, 1944. Do you know of anyone interested in having an exhibit?

It will be necessary to make reservations for booth space immediately.

Please send the names and addresses of prospective exhibitors to the committee as soon as possible. Your cooperation will be appreciated, as time is limited.

Please refer any communications regarding State or Local Societies to Cecelia M. Kortuem, M.T. (ASCP), 1164 N. Dearborn St., Chicago 10, Illinois.

PERUVIAN OFFICERS DONATE BLOOD AS CHRISTMAS GIFT TO ALLIED FIGHTING MEN

Washington.—Twenty-five young Peruvian army officers have demonstrated their faith in democracy with their blood, in a gesture of inter-American solidarity.

Led by Colonel Armando Revoredo, Air Attache at the Peruvian Embassy here, the contingent trooped into the local Red Cross Blood Donor Center "to make a Christmas present to Allied soldiers." Each of the officers donated a pint of blood.

Many of the officers are in training at army camps in various parts of this country, and had come to Washington to spend the Christmas holidays together. When Captain Enrique Fuller, of the Peruvian Air Force, suggested donating blood to help save some Allied soldier's life, the response was unanimous. Every one of the Peruvian officers present accepted the proposal with enthusiasm.

SERVICE ROLL



Members of the American Society of Medical Technologists in
the service of their country :

Lt. Col. Arthur T. Brice
Major J. A. Wood
Major Theodore Keiper
Capt. Walter J. Dell
Ralph M. Carrel, 1st Lt. SnC
Lt. Timothy L. Duggan
Frederick W. Hindley, 1st Lt. Sanitary Corps.
Lt. Margaret E. Johnston, W.A.C.
Lt. Margaret M. Nichols
Lt. Wm. J. Noble, Jr., Sn. C.
Lt. Margaret M. Petritz
Nelson E. Brown, Ph.M 1/cU.S.N.
Ensign Dorothy L. Chandler, W.V.(S) U.S.N.R.
George B. Campbell, Ph.M. 1c
Raymond J. Gough, Ph. M 1/c
Afc Helene E. Jacobs, WAC
Pvt. Margaret E. Little
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